Course Syllabus of Ultrasound physics

Faculty: Faculty of Medicine and Health Sciences
Department: Health Sciences
Program: Bachelor in Radiologic Technology & Medical Imaging

I. General information about the course instructor :							
Name	Dr. Abdullah Taher						
Location & phone number	UST- 715989708	Sat	Sun	Mon	Tue	Wed	Thu
Email	A.taher2@ust.edu				√		

II. General information about the course:					
1.	Course Title :	Ultrasound physics			
2.	Course Code and Number :	BMI322			
3.	Credit Hours :	Credit Hours			Total
		Theoretical	Seminar/Tutorial/Practical	Training	
		2	1		3
4.	Study Level and Semester:	3rd level / 2nd semester			
5.	Pre-requisites :	BMI111			
6.	Co-requisites:	None			
7.	Program in which the course is offered:	Bachelor in Radiologic Technology & Medical Imaging			
8.	Teaching Language:	English			
9.	Instruction location:	University of Science and Technology, Sana'a, Yemen			

III. Course Description

This course provides the students with concepts and phenomena involved in ultrasound beam characteristic and behavior. A good conceptual understanding of the behavior of sounds waves in various media, the ultrasound beam and the transducer are essential to discern image characteristics and avoid artifact. Ultrasound of various body systems will be briefly outlined. Demonstration sessions are included with using of ultrasound machine and real images are shown to emphasize the understanding. All topic related to ultrasound physical principles will be Covered in the course. The teaching will include practice sessions with collaborative learning, dialogue and discussion. The students will be evaluated through assignment, practical and written exams. General physics course is a pre-requisite for this course.

عميد الكلية:
د. عبدالله المخلافي

رئيس القسم:
د. عبدالحبيب القباطي

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معتمد
APPROVED

المراجع :
د. امين الفلاحي
د. مجاهد نصار

الموصف :
د. عبد الله طاهر

IV. Course Aims:

1. Provide students with the theoretical and practical background of identifying the various types of mechanical waves and the sound spectrum and calculating their frequency, wavelength and intensity.
2. Teach student the basic dealing to evaluate reflection characteristics based on acoustic impedance calculation, and operational characteristics of an ultrasound transducer.
3. Improve student skills to know concepts of an array of elements and beam formation, resolution and focusing to obtain the optimum image.
4. Provide student the fundamental skills of standards scanning physical procedures and setting based on quality assurance and protection standards in medical imaging for ultrasound scanning including the Doppler mode.

V. Course Intended Learning Outcomes (CILOs) :

1. Explain the fundamental concepts of ultrasound physics based on quality assurance principles in medical imaging.
2. Identify the ultrasound system components related to general and Doppler ultrasound scanning.
3. Describe the sequence of general ultrasound imaging protocol based on physical principle and beam profile.
4. Analyze the sonogram formation procedures and recognize the artifacts as well as the source of machinery limitations.
5. Manipulate safely the basics ultrasound imaging components according to physical ultrasound principles.
6. Apply the ALARA principle in preparation of ultrasound system to protect patients during ultrasound imaging process.
7. Perform the QA tests and procedures to ensure optimal operation of ultrasound imaging modalities.
8. Perform the appropriate preparation and positioning in ultrasound imaging process according to physical principles of ultrasound.
9. Dealing appropriately with ultrasound system facilities based on administrative rules.

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VI. Course Contents

First: Theoretical Aspect:

No.	Course Topics/Units	Sub-topics	Week due	Contact Hours
	Introduction	- Course contents - Introduction to equipment - Introduction to screen orientation	1st	2
	Ultrasound Properties	- Ultrasound production - Type of wave - Sound nature and characteristics	2nd ,3rd	4
	Ultrasound Propagation and Range equation	- Reflection - Refraction - Absorption - Scattering - Range equation and sonar	4th ,5th,6th	6
	Mid-exam	-	7th	2
	Ultrasound transducers	- Natural crystal - Man-made crystal - Curie point - Elements of transducer	8th.9th	4
	Ultrasound artifacts	- Source of artifact - Multiple echo-paths - Velocity error - Attenuation - Beam profile - Clinical aspect artifact	10th, 11th	4
	Ultrasound Doppler	- History of Doppler - Equation of Doppler - Type of Doppler - Clinical aspect of Doppler	12th	2
	Ultrasound bio effects	- Definition - Mechanical bio effect - Thermal bio effects	13th,14th	4
	Final exam	- Written exam	15th	2
Total number of weeks and hours				30

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:Second: Clinical Aspects			
No.	Practice topics	**Week due**	**Contact Hours**
1	Introduction (US fundamentals)	2nd	2
2	Ultrasound Properties	**3rd -4th**	**4**
3	Ultrasound Propagation and Range equation	**5th -6th**	**4**
4	Ultrasound transducers	**7th -8th**	**4**
5	Ultrasound artifacts	**9th -10th**	**4**
6	Ultrasound Doppler	**11th -12th**	**4**
7	Ultrasound bio effects	**13th**	**2**
8	Final exam	**14th**	**2**
	Total number of weeks and hours	13	**26**

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